

American Academy of Entomological Sciences

Knowledge, Experience, Commitment

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STUDY TITLE:	Efficacy Evaluation of the Bell + Howell Ultrasonic Pest Repeller

SUMMARY

Upon completing the reading and evaluation of the laboratory testing documents by SGS-CSTC Inspection Services (“SGS”) and Intertek International, Inc. (“Intertek”), on rats, mice, ants, spiders, and cockroaches using the Bell + Howell Ultrasonic Pest Repeller, the findings and recorded data demonstrate significant effect in repelling the target animals as reported in the document **Bell + Howell Ultrasonic Pest Repeller Efficacy Test Report**.

OBJECTIVES

- I. Evaluate the efficacy of the Bell + Howell Ultrasonic Pest Repeller on target organisms.
- II. Evaluate the validity of the laboratory experiments and reports testing the efficacy of the Bell + Howell Ultrasonic Pest Repeller by SGS.

III. Evaluate the validity of the laboratory experiments and reports testing the efficacy of the Bell + Howell Ultrasonic Pest Repeller by Intertek.

IV. Evaluate the validity of Dr. Richard Kaae's test designs and report.

OPENING STATEMENT

I have been a Registered Professional Entomologist (RPE) and Board Certified Entomologist (BCE) for over thirty years and have worked with many companies designing, testing, and creating products for rodents and insects for the consumer and professional markets.

As former Technical Director for the American Sanitation Institute, about thirty Registered Sanitarians under my supervision and training inspected and consulted to thousands of companies in the food manufacturing, warehousing, and pharmaceutical industries. Their primary job was to help these companies conform to good manufacturing practices in order to insure they are in compliance with FDA, USDA, local, and state sanitation practice regulations to avoid criticism and possible regulatory fines and closure. In that position, I personally consulted on hundreds of regulatory citations against companies for sanitary infractions, including rodent and insect problems. Out of the thousands of companies that my thirty Registered Sanitarians inspected and consulted to, none of the FDA, USDA, state, and local inspectors ever asked our clients to neither remove any ultrasonic pest repellers from any of their facilities nor have been cited for having them.¹

¹ I served as Technical Director for the American Sanitation Institute from 1983-86. In that position, I do not recall any regulatory agencies requesting the removal of ultrasonic pest repellers.

The Registered Sanitarians recommended multiple ultrasonic pest repellers, along with additional methods², within facilities to allow the repellers clear access from objects that would absorb the ultrasonic waves and weaken the effectiveness of the repellency.

An example of a successful ultrasonic pest repeller is manufactured by Victor®, a leader of non-toxic pest control products. Victor® ultrasonic repellant research testing has been granted registration by the Health Canada Pest Management Regulatory Agency (PMRA) (known as the Canadian EPA). Victor Ultrasonic PestChaser®, Types of Ultrasonic Repellents, available at <http://www.victorpest.com/advice/all-about/victor-repellents/types-of-repellents>.

The PMRA has accepted all of Victor® ultrasonic repellant claims, despite their strict testing standards and results on electronic rodent repellent devices. *Id.*

When using Victor® ultrasonic pest repellers in laboratory testing with mice, food consumption was reduced by 67%, which is similar to the results by SGS and Intertek. *Id.* In field tests series, Victor® ultrasonic pest repellers successfully repelled the rodents from protected areas in thirteen of the seventeen (13 of the 17) sites with a success rate of 81.3%. *Id.* Victor® test results are consistent with the results founded by SGS and Intertek.

² Additional methods include, but is not limited to, mechanical traps, glue boards, bait stations, etc.

FINDINGS

I. EVALUATION OF THE EFFICACY OF THE BELL + HOWELL ULTRASONIC PEST REPELLER ON TARGET ORGANISMS

Upon completing the evaluation of the tests by SGS and Intertek, I observed that the recorded results and data confirm that the Bell + Howell Ultrasonic Pest Repeller did significantly confirm repellent results against the target organisms as reported in the six experiments conducted by the two independent companies. This data corresponds to testing by other companies such as Victor®, a leading manufacturer of non-toxic pest control products, including an ultrasonic pest repeller.

II. EVALUATION OF THE VALIDITY OF THE LABORATORY EXPERIMENTS AND REPORTS TESTING THE EFFICACY OF THE BELL + HOWELL ULTRASONIC PEST REPELLER BY SGS

I evaluated the experimental designs, testing, and data by SGS to test the efficacy of the Bell + Howell Ultrasonic Pest Repeller on rodents and insects. In the SGS report, it states that SGS conducted observations of rats and mice “for 11 days, including 7 days (or 168 hours) + 2 days Preliminary Testing and 2 days Post Testing.” Efficacy Evaluation Bell + Howell Ultrasonic Pest Repeller Against Mice/Rats, p. 2; *see also* Efficacy Evaluation of Bell + Howell Ultrasonic Pest Repeller Against Ants/Spiders/Roaches, p. 2 (SGS conducted observations of ants, spiders, and cockroaches using the same protocol as the test with mice and rats).

SGS conducted a choice test allowing the target animals to choose between two locations, with or without the potential influence of the Bell + Howell

Ultrasonic Pest Repeller. A choice test is when an organism is given the option to go towards an attractant, such as food, or away from a repellant, such as an ultrasonic pest repeller. Choice tests are used extensively by testing organizations and universities to test, observe, and record the effect of repellents and attractants. Choice tests are good laboratory practices.

It is important to adhere to good laboratory practices, as exhibited by SGS, such as (1) conducting a two-day preliminary test to let the target animals acclimate to the surroundings and to evaluate the design before beginning the seven-day study and (2) conduct two-days of post period testing to compare the previous seven-day testing period.

The significance of a preliminary two-day test and two-day post test is that the tests are usually conducted when adhering to good laboratory practices. The World Health Organization, through the Organization for Economic Co-operation and Development, defines good laboratory practice as follows:

[A] quality system concerned with the organisational [*sic*] process and the conditions under which non-clinical health and environmental safety studies are planned, performed, monitored, recorded, archived and reported.

World Health Organization, *Good Laboratory Practice (GLP) Handbook* at 7 (2nd ed. 2011). Compliance with good laboratory practices “is intended to assure the quality and integrity of . . . data filed.” 21 C.F.R. § 58.1(a).

SGS also followed good laboratory practices when “The test sample [was] stored in a locked cabinet at ambient temperature and humidity until use in the study.” Efficacy Evaluation Against Mice/Rats, p. 2; *see also* Efficacy Evaluation

Against Ants/Spiders/Roaches, p. 2. Following this procedure protects the integrity of the sample or device to be tested. When recording the data on food and water consumption, SGS recorded “in each chamber on a 24-hour interval throughout the 7-day (or 168 hours) period [when the repeller was switched on].” Efficacy Evaluation Against Mice/Rats, p. 4; *see also* Efficacy Evaluation Against Ants/Spiders/Roaches, p. 4. During this time, the ants, spiders, cockroaches, rats, and mice were given “7 days (168 hours) to move freely around Chamber A and Chamber B [when the repeller was switched on].” Efficacy Evaluation Against Mice/Rats, p. 4; *see also* Efficacy Evaluation Against Ants/Spiders/Roaches, p. 4. In the context of the choice test, when the rodents and insects move freely on a twenty-four-hour basis, this allows the lab to get precise data points on the consumption of food and water. These data points provide for accurate results.

The reports show photographs of how the chambers have an un-removable seal in such a way that any tampering of the experimental design cannot occur. Efficacy Evaluation Against Mice/Rats, p. 7; *see also* Efficacy Evaluation Against Ants/Spiders/Roaches, p. 7. An un-removable seal is vital to ensure that no one but the researchers will be measuring the food and water consumption.

A. Evaluation of Tabular Data: Test Results and Data Measurement of Rats and Mice (SGS)

The tables labeled “Test Result Data Measurement – RATS” and “Test Result Data Measurement – MICE” lists the raw data for Chamber A (with pest repeller) and Chamber B (no repeller). *See* Efficacy Evaluation Against Mice/Rats, p. 8, 10.

This data measured “quantity,” “consumed water,”³ and “consumed food”⁴ for the two-day “Preliminary Testing” (labeled “Pre Test”) (Switch Off), seven day “During Testing” (Switch On), and two-day “Post Testing” (labeled “Post Test”) (Switch Off).⁵ I conducted weighted comparisons between the food and water consumed for Chamber A and Chamber B for both rats and mice.

1. Consumed water and food percentage of the rats in Chamber B (no repeller)

Chamber B (no repeller)											
RATS	PRE TEST		DURING TESTING							POST TEST	
	SWITCH OFF		SWITCH ON							SWITCH OFF	
	-2 Day	-1 Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	+1 Day	+2 Day
Quantity	5	5	10	10	10	10	10	10	10	5	3
Water	58.89%	54.26%	88.15%	84.91%	91.40%	90.40%	90.98%	88.65%	87.24%	50.11%	50.56%
Food	34.50%	85.90%	99.30%	95.13%	98.53%	95.95%	95.67%	92.41%	97.12%	50.49%	51.00%
Chamber A (with pest repeller)											
Quantity	4	2	0	0	0	0	0	0	0	5	7
Water	41.11%	45.74%	12.85%	16.19%	8.60%	9.60%	9.02%	11.35%	12.76%	49.89%	49.44%
Food	65.50%	14.10%	1.70%	4.87%	1.49%	4.05%	4.33%	7.59%	2.88%	49.51%	49.00%

(Table 1)

The facts described by the recorded data indicate that each day during the seven day “During Testing” period when the repeller was switched on, significantly more water and food was consumed in Chamber B (no repeller) than Chamber A (with pest repeller). Consumption by rats in Chamber B (no repeller) ranged from (84.91% to 91.40% for water) and (92.41% to 99.30% for food) until the Post Test days when the repeller was switched off.

³ The amount of consumed water was measured in milliliters.

⁴ The amount of consumed food was measured in grams.

⁵ The “Switch On” and “Switch Off” indicates when the ultrasonic pest repeller was turned on within Chamber A (the chamber with the ultrasonic pest repeller).

During the Post Test days, the food and water consumption was statistically the same, at approximately 50%, between the two chambers demonstrating that the rodents equilibrated in Chambers A and B. This shows that the rodents moved freely between the two chambers once the repeller was turned off and that the biological activity was *greater* in Chamber B (no repeller) when the repeller was turned on. Therefore, the data exhibited that the *rats were repelled* from the Bell + Howell Ultrasonic Pest Repeller.

2. Consumed water and food percentage of the mice in Chamber B (no repeller)

Chamber B (no repeller)											
MICE	PRE TEST		DURING TESTING							POST TEST	
	SWITCH OFF		SWITCH ON							SWITCH OFF	
	-2 Day	-1 Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	+1 Day	+2 Day
Quantity	8	5	10	9	8	9	9	9	10	4	2
Water	57.06%	55.55%	64.06%	59.61%	54.54%	60.71%	66.66%	63.63%	60.27%	51.38%	52.63%
Food	40.70%	25%	79.41%	62.16%	82.05%	83.33%	85.18%	87.80%	60.27%	42.10%	46.15%
Chamber A (with pest repeller)											
Quantity	2	5	0	1	2	1	1	1	0	6	8
Water	42.94%	44.45%	35.94%	40.39%	45.45%	39.28%	33.33%	36.36%	39.73%	48.61%	47.36%
Food	59.30%	75%	20.58%	37.83%	17.94%	16.66%	14.81%	12.19%	39.73%	57.89%	46.15%

(Table 2)

The facts described by the recorded data indicate that water consumption was slightly higher in Chamber B (no repeller) than Chamber A (with pest repeller) During Testing with the switch on. Food consumption was significantly higher in

Chamber B, as would be expected with mice because they hydrolyze⁶ water) from the food they consume. This discrepancy explains why the amount of water consumed is similar in both chambers in the During Testing period.

In the two Post Test days when the Bell + Howell Ultrasonic Pest Repeller was switched off, the food and water consumption was essentially equal in Chambers A and B because the mice equilibrated. This shows that the mice moved freely between the two chambers once the repeller was turned off and that the biological activity was *greater* in Chamber B (no repeller) when the repeller was turned on. Therefore, the data exhibited that the *mice were repelled* from the Bell + Howell Ultrasonic Pest Repeller.

3. Observed and recorded data of rats and mice fecal pellet & urine spots

(Table 3)

SWITCH ON/OFF		DATE	SUBJECT	OBSERVATION OF FECAL PELLET & URINE SPOTS	
				Chamber A (with pest repeller)	Chamber B (no repeller)
PRE TEST	SWITCH OFF	1-Dec-11	MICE	Little	More
			RATS	Equal	Equal
		2-Dec-11	MICE	More	Little
			RATS	Equal	Equal
DURING TESTING	SWITCH ON	3-Dec-11	MICE	Little	More
			RATS	Little	More
		4-Dec-11	MICE	Very Little	More
			RATS	Very Little	More
		5-Dec-11	MICE	Very Little	More
			RATS	Little	More
		6-Dec-11	MICE	Very Little	More

⁶ Mice have the ability to obtain the water out of the food they consume, unlike rats, that need a significant larger amount of water per day.

		7-Dec-11	RATS	Very Little	More
			MICE	Very Little	More
			RATS	Very Little	More
		8-Dec-11	MICE	Very Little	More
			RATS	Very Little	More
		9-Dec-11	MICE	Very Little	More
			RATS	Very Little	More
	POST TEST	10-Dec-11	MICE	Equal	Equal
			RATS	Equal	Equal
		11-Dec-11	MICE	Equal	Equal
			RATS	Equal	Equal

The data described in Table 3 (above) coincides with the consumption and non-consumption of food and water data provided in Table 1 and 2. All three Tables demonstrate that the more food and water rats and mice consumed in Chamber B (no repeller), the higher amount of fecal and urine they deposited in Chamber B. Thus, the rats and mice were *repelled* from the Bell + Howell Ultrasonic Pest Repeller, displayed by the overall higher amount of activity in Chamber B (no repeller).

4. Conclusion of the evaluation of tabular data: Test results and data measurement of rats and mice

The researchers concluded that the rats and mice were repelled from Chamber A (with pest repeller) when the Bell + Howell Ultrasonic Pest Repeller was switched on. See Rats/Mice Test Report Result Analysis, p. 18. In their report, the reserchers followed good laboratory practices in their scientific design that would be acceptable to many testing organizations. The report states:

The tunnel is “curved” and two chambers are designed in HI-LO level. The curved and Hi-Lo tunnel design is to further ensure ultrasonic sound wave[s] will not enter from [C]hamber A into [C]hamber B since sound wave[s] [are] very directional.

Id. Ultrasonics are soundwaves with frequencies higher than the upper audible limit of human hearing. Ultrasound is no different from normal (audible) sound in that its physical properties cannot be heard by humans at approximately 20 kilohertz (20,000 hertz). The curved tunnel design and “Hi-Lo” level protects the direction of the ultrasonic waves of the Bell + Howell Ultrasonic Pest Repeller. This inhibits the waves from going on a straight plane from Chamber A to Chamber B, confusing the rodents.

In addition, the scientific design of the experiment conducted by SGS adhered to good laboratory practices because they used electronic scales (not manual scales) to measure food and water before and after each day of the eleven day test.⁷ The scientific design and data, combined with good laboratory practices, confirms to me that the SGS experiments are a credible approach to proving that the Bell + Howell Ultrasonic Pest Repeller effectively repels rats and mice.

From observation of the data results, due to the fact that significantly more food and water was consumed by rats and mice in Chamber B (no repeller), I conclude that the rats and mice behavior was caused by the Bell + Howell Ultrasonic Pest Repeller when the device was switched on.

⁷ The use of electronic scales is more accurate than manual scales. This leads to more precise and reliable measurements.

B. Evaluation of Tabular Data: Test Results and Data Measurement of Ants, Spider, and Cockroaches (SGS)

The tables labeled “Test Result Data Measurement – Spider” and “Test Result Data Measurement – Roaches and Ants” lists the raw data for Chamber A (with pest repeller) and Chamber B (no repeller). *See Efficacy Evaluation Against Ants/Spiders/Roaches*, p. 8, 10. This data measured “quantity,” “consumed water,”⁸ and “consumed food”⁹ for the two-day Pre Test (Switch Off), seven day During Testing (Switch On), and two-day Post Test (Switch Off).¹⁰ I conducted weighted comparisons between the food and water consumed for Chamber A and Chamber B for spiders, ants, and cockroaches.

1. Consumed water and food percentage of spiders in Chamber B (no repeller)

Chamber B (no repeller)											
SPIDER	PRE TEST		DURING TESTING							POST TEST	
	SWITCH OFF		SWITCH ON							SWITCH OFF	
	-2 Day	-1 Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	+1 Day	+2 Day
Quantity	10	10	19	18	19	20	20	20	20	12	9
Water	41.79%	44.83%	57.14%	85.50%	73.47%	87.50%	81.25%	94%	86.44%	54.26%	45.74%
Food	75%	50%	100%	80%	100%	100%	100%	100%	100%	14.28%	50%
Chamber A (with pest repeller)											
Quantity	10	10	1	2	1	0	0	0	0	8	11
Water	58.20%	55.17%	42.86%	14.49%	26.53%	12.5%	18.75%	6%	13.56%	45.74%	54.26%
Food	25%	50%	0	20%	0	0	0	0	0	42.86%	50%

(Table 4)

⁸ The amount of consumed water was measured in milliliters.

⁹ The amount of consumed food was measured in grams.

¹⁰ The “Switch On” and “Switch Off” indicates when the ultrasonic pest repeller was turned on within Chamber A (the chamber with the ultrasonic pest repeller).

The facts described by the recorded data indicate that each day during the seven day During Testing period when the repeller was switched on, significantly more water and food was consumed in Chamber B (no repeller) than Chamber A (with pest repeller). Consumption by spiders in Chamber B (no repeller) ranged from (57.14% to 94% for water) and (100% for food) until the Post Test days when the repeller was switched off.

During the Post Test days, the food and water consumption was statistically the same, at approximately 50%, between the two chambers demonstrating that the spiders equilibrated in Chambers A and B. This fact shows that the spiders moved freely between the two chambers once the repeller was turned off and that spider biological activity was *greater* in Chamber B (no repeller) when the repeller was turned on. Therefore, the data exhibited that the *spiders were repelled* from the Bell + Howell Ultrasonic Pest Repeller.

2. Consumed water and food percentage of ants and cockroaches in Chamber B (no repeller)

Chamber B (no repeller)											
ANTS & ROACH	PRE TEST		DURING TESTING							POST TEST	
	SWITCH OFF		SWITCH ON							SWITCH OFF	
	-2 Day	-1 Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	+1 Day	+2 Day
Quantity	10	10	19	18	19	20	20	20	20	12	9
Water	41.67%	66.66%	83.33%	66.67%	82.35%	71.43%	90%	86.67%	100%	46.67%	45.45%
Food	50%	100%	100%	80%	100%	100%	100%	100%	100%	40%	50%
Chamber A (with pest repeller)											
Quantity	10	10	1	2	1	0	0	0	0	8	11
Water	58.33%	33.34%	16.16%	33.33%	17.65%	28.57%	10%	13.33%	0	53.33%	54.55%
Food	50%	0	0	20%	0	0	0	0	0	60%	50%

(Table 5)

The facts described by the recorded data indicate that each day during the seven day During Testing period when the repeller was switched on, significantly more water and food was consumed in Chamber B (no repeller) than Chamber A (with pest repeller). Consumption by the ants and cockroaches in Chamber B (no repeller) ranged from (66.67% to 100% for water) and (80% to 100% for food) until the Post Test days when the repeller was switched off.

During the Post Test days, the food and water consumption was statistically the same, at approximately 50%, between the two chambers demonstrating that the ants and cockroaches equilibrated in Chambers A and B. Cockroaches need water each day to survive and this fact is substantiated by the higher percentage of water consumed in Chamber B (no repeller). The ants and cockroaches moved freely between the two chambers once the repeller was turned off. This demonstrates that the biological activity was *greater* in Chamber B (no repeller) when the repeller was turned on. Therefore, the data exhibited that the *ants and cockroaches were repelled* from the Bell + Howell Ultrasonic Pest Repeller.

3. Observed and recorded data of cockroach fecal pellets

(Table 6)

SWITCH ON/OFF		DATE	SUBJECT	OBSERVATION OF FECAL PELLETS	
				Chamber A (with pest repeller)	Chamber B (no repeller)
PRE TEST	SWITCH OFF	11-Mar-12	Roaches	Equal	Equal
		12-Mar-12	Roaches	Equal	Equal

DURING TESTING	SWITCH ON	13-Mar-12	Roaches	Very Little	More
		14-Mar-12	Roaches	Very Little	More
		15-Mar-12	Roaches	Very Little	More
		16-Mar-12	Roaches	No	More
		17-Mar-12	Roaches	No	More
		18-Mar-12	Roaches	No	More
		19-Mar-12	Roaches	No	More
POST TEST	SWITCH OFF	20-Mar-12	Roaches	Equal	Equal
		21-Mar-12	Roaches	Equal	Equal

The data described in Table 6 (above) coincides with the consumption and non-consumption of food and water data provided in Table 4 and 5. All three Tables demonstrate that the more food and water the cockroaches consumed in Chamber B (no repeller) the higher amount of fecal pellets they deposited in Chamber B. Thus, the *cockroaches were repelled* from the Bell + Howell Ultrasonic Pest Repeller, displayed by the overall higher amount of activity in Chamber B (no repeller).

4. Conclusion of the evaluation of tabular data: Test results and data measurement of ants, spiders, and cockroaches

The researchers concluded that the ants, spiders, and cockroaches were repelled from Chamber A (with pest repeller) when the Bell + Howell Ultrasonic Pest Repeller was switched on. See 2012 Spiders/Ants/Roaches Test Report Result Analysis, p. 18 (Mar 27, 2012). In their report, the reserchers followed good

laboratory practices in their scientific design that would be acceptable to many testing organizations. The report states:

The tunnel is “curved” and two chambers are designed in HI-LO level. The curved and Hi-Lo tunnel design is to further ensure ultrasonic sound wave[s] will not enter from [C]hamber A into [C]hamber B since sound wave[s] [are] very directional.

Id. Ultrasonics are soundwaves with frequencies higher than the upper audible limit of human hearing. Ultrasound is no different from normal (audible) sound in that its physical properties cannot be heard by humans at approximately 20 kilohertz (20,000 hertz). The curved tunnel design and “Hi-Lo” level protects the direction of the ultrasonic waves of the Bell + Howell Ultrasonic Pest Repeller. This inhibits the waves from going on a straight plane from Chamber A to Chamber B, confusing the insects.

In addition, the scientific design of the experiment conducted by SGS adhered to good laboratory practices because they used electronic scales to measure food and water before and after each day of the eleven day test. The scientific design and data, combined with good laboratory practices, confirms that the SGS experiments are a credible approach to proving that the Bell + Howell Ultrasonic Pest Repeller effectively repels ants, spiders, and cockroaches.

From observation of the data results, due to the fact that significantly more food and water was consumed by ants, spiders, and cockroaches in Chamber B (no repeller), I conclude that the ants, spiders, and cockroaches behavior was caused by the Bell + Howell Ultrasonic Pest Repeller when the device was switched on.

III. EVALUATION OF THE VALIDITY OF THE LABORATORY EXPERIMENTS AND REPORTS TESTING THE EFFICACY OF THE BELL + HOWELL ULTRASONIC PEST REPELLER BY INTERTEK

Intertek conducted similar tests as SGS to either confirm or contradict the results of the Efficacy Evaluation Against Mice/Rats and the Efficacy Evaluation Against Ants/Spiders/Cockroaches. It is a common practice in scientific research for scientists to confirm other researchers' findings using an "identical" scientific design.

I evaluated the experimental designs, testing, and data by Intertek to test the efficacy of the Bell + Howell Ultrasonic Pest Repeller on rodents and insects. In the Intertek report, it states that Intertek conducted observations of rats, mice, ants, spiders, and cockroaches for "11 days period, including 2 days Preliminary[T]est, 7 days During [T]est and 2 days Post [T]est." Test Report, Report Number: 140515021GZU-002, p. 3 (July 7, 2014) (Ants, Spiders, and Cockroaches); *see also* Test Report, Report Number: 140515021GZU-001, p. 3 (July 7, 2014) (Rats and Mice) (Intertek conducted observations of rats and mice using the same protocol as the test with ants, spiders, and cockroaches).

Intertek conducted a choice test allowing the target animals to choose between two locations, with or without the potential influence of the Bell + Howell Ultrasonic Pest Repeller. A choice test is when an organism is given the option to go towards an attractant, such as food, or away from a repellant, such as an ultrasonic pest repeller. Choice tests are used extensively by testing organizations and

universities to test, observe, and record the effect of repellents and attractants. Choice tests are good laboratory practices.

It is important to adhere to good laboratory practices, as exhibited by Intertek, such as (1) conducting a two-day preliminary test to let the target animals acclimate to the surroundings and to evaluate the design before beginning the seven-day study and (2) conduct two-days of post period testing to compare the previous seven-day testing period.

The significance of a preliminary two-day test and two-day post test is that the tests are usually conducted when adhering to good laboratory practices. The World Health Organization, through the Organization for Economic Co-operation and Development, defines good laboratory practice as follows:

[A] quality system concerned with the organizational [*sic*] process and the conditions under which non-clinical health and environmental safety studies are planned, performed, monitored, recorded, archived and reported.

World Health Organization, *Good Laboratory Practice (GLP) Handbook* at 7 (2nd ed. 2011). Compliance with good laboratory practices “is intended to assure the quality and integrity of . . . data filed.” 21 C.F.R. § 58.1(a).

Intertek also followed good laboratory practices when “The test samples were stored in a locked cabinet at ambient temperature and humidity until use in the testing.” Test Report of Ants, Spiders, and Cockroaches, p. 3; *see also* Test Report of Rats and Mice, p. 3.

Following this procedure protects the integrity of the sample or device to be tested. When recording the data on food and water consumption, Intertek recorded

at “24 [hour] intervals for 7 days (or 168 hours)” and “before and after device installation.” Test Report of Ants, Spiders, and Cockroaches, p. 3, 4; *see also* Test Report of Rats and Mice, p. 3, 4.

During this time, the ants, spiders, cockroaches, rats, and mice were given “7 days (168 hours) to move freely around Chamber A and Chamber B and the tunnel when the Ultrasonic Pest Repeller is [on].” Test Report of Ants, Spiders, and Cockroaches, p. 4; *see also* Test Report of Rats and Mice, p. 4. In the context of the choice test, when the rodents and insects move freely on a twenty-four-hour basis, this allows the lab to get precise data points on the consumption of food and water. These data points provide for accurate results.

The reports show photographs of how the chambers have an un-removable seal in such a way that any tampering of the experimental design cannot occur. Test Report of Ants, Spiders, and Cockroaches, p. 7; *see also* Test Report of Rats and Mice, p. 8. An un-removable seal is vital to ensure that no one but the researchers will be measuring the food and water consumption.

A. Evaluation of Tabular Data: Test Results and Data Measurement of Ants, Spiders, and Cockroaches (Intertek)

The table labeled “Test Result” for ants, spiders, and cockroaches lists the raw data for Chamber A (with pest repeller) and Chamber B (no repeller). *See* Test Report of Ants, Spiders, and Cockroaches, p. 5. This data measured “quantity,” “consumed water,”¹¹ and “consumed food”¹² for the two-day Pre Test (Switch Off),

¹¹ The amount of consumed water was measured in milliliters.

¹² The amount of consumed food was measured in grams.

seven day During Testing (Switch On), and two-day Post Test (Switch Off).¹³

I conducted weighted comparisons between the food and water consumed for Chamber A and Chamber B for the ants, spiders, and cockroaches.

1. Consumed water and food percentage of the ants, spiders, and cockroaches in Chamber B (no repeller)

Chamber B (no repeller)												
ANTS/SPIDERS/ ROACHES		PRE TEST		DURING TESTING							POST TEST	
		SWITCH OFF		SWITCH ON							SWITCH OFF	
		-2 Day	-1 Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	+1 Day	+2 Day
Quantity	Spiders	7	7	7	9	8	9	9	10	10	7	6
	Roaches	3	4	5	10	9	10	10	10	10	8	5
	Ants	6	4	6	9	10	9	10	10	10	4	3
Water		30.43%	46.51%	49.74%	62.86%	63.41%	68%	58.82%	73.33%	66.67%	43.91%	39.47%
Food		25%	38.46%	100%	100%	100%	33.33%	100%	100%	75%	66.64%	25%
Chamber A (with pest repeller)												
Quantity	Spiders	3	3	3	1	2	1	1	0	0	3	4
	Roaches	7	6	5	0	1	0	0	0	0	2	5
	Ants	4	6	4	1	0	1	0	0	0	6	7
Water		69.56%	53.49%	40.26%	37.14%	36.58%	32%	41.18%	26.67%	33.33%	56.09%	60.53%
Food		75%	61.54%	0	0	0	66.66%	0	0	25%	33.33%	75%

(Table 7)

The facts described by the recorded data indicate that each day during the seven day During Testing period when the repeller was switched on, significantly more water and food was consumed in Chamber B (no repeller) than Chamber A (with pest repeller). Consumption by ants, spiders, and cockroaches in Chamber B

¹³ The “Switch On” and “Switch Off” indicates when the ultrasonic pest repeller was turned on within Chamber A (the chamber with the ultrasonic pest repeller).

(no repeller) ranged from (46.51% to 73.33% for water) and (33.33% to 100% for food) until the Post Test days when the repeller was switched off.

During the Post Test days, the food and water consumption was statistically the same, at approximately 50%, between the two chambers demonstrating that the ants, spiders, and cockroaches equilibrated in Chambers A and B. Insects need more water than food (especially cockroaches) to survive on a daily basis until they can secure food. This fact shows that the ants, spiders, and cockroaches moved freely between the two chambers once the repeller was turned off and that the biological activity was *greater* in Chamber B (no repeller) when the repeller was turned on. Therefore, the data exhibited that the *ants, spiders, cockroaches were repelled* from the Bell + Howell Ultrasonic Pest Repeller.

2. Observed and recorded data of cockroach fecal pellets

SWITCH ON/OFF		DATE	SUBJECT	OBSERVATION OF FECAL PELLETS	
				Chamber A (with pest repeller)	Chamber B (no repeller)
PRE TEST	SWITCH OFF	17-Mar-12	Roaches	Equal	Equal
		18-Mar-12	Roaches	Equal	Equal
DURING TESTING	SWITCH ON	19-Mar-12	Roaches	Equal	Equal
		20-Mar-12	Roaches	Little	More
		21-Mar-12	Roaches	Little	More
		22-Mar-12	Roaches	Little	More
		23-Mar-12	Roaches	Little	More
		24-Mar-12	Roaches	Little	More
		25-Mar-12	Roaches	Little	More

POST TEST	SWITCH OFF	26-Mar-12	Roaches	Little	More
		27-Mar-12	Roaches	No	Equal

(Table 8)

The data described in Table 8 (above) coincides with the consumption and non-consumption of food and water data provided in Table 7. Both Tables demonstrate that the more food and water the cockroaches consumed in Chamber B (no repeller) the higher amount of fecal pellets they deposited in Chamber B. Thus, the *cockroaches were repelled* from the Bell + Howell Ultrasonic Pest Repeller, displayed by the overall higher amount of activity in Chamber B (no repeller).

3. Conclusion of the evaluation of tabular data: Test results and data measurement of ants, spiders, and cockroaches

The Intertek researchers concluded that the ants, spiders, and cockroaches were repelled from Chamber A (with pest repeller) when the Bell + Howell Ultrasonic Pest Repeller was switched on. See 2014 Spiders/Ants/Roaches Test Report Result Analysis (July 7, 2014). In their report, the reserchers followed good laboratory practices in their scientific design that would be acceptable to many testing organizations. The report states:

The tunnel was “curved” and two chambers were designed in Hi-Lo level. The curved and Hi-Lo tunnel design was to further ensure ultrasonic sound wave[s] will not enter from [C]hamber A into [C]hamber B since sound wave[s] [are] directional.

Id. Ultrasonics are soundwaves with frequencies higher than the upper audible limit of human hearing. Ultrasound is no differnet from normal (audible) sound in that its physical properties cannot by heard by humans at approximately 20

kilohertz (20,000 hertz). The curved tunnel design and “Hi-Lo” level protects the direction of the ultrasonic waves of the Bell + Howell Ultrasonic Pest Repeller. This inhibits the waves from going on a straight plane from Chamber A to Chamber B, confusing the insects.

In addition, the scientific design of the experiment conducted by Intertek adhered to good laboratory practices because they used electronic scales to measure food and water before and after each day of the eleven day test. The scientific design and data, combined with good laboratory practices, confirms that the Intertek experiments are a credible approach to proving that the Bell + Howell Ultrasonic Pest Repeller effectively repels ants, spiders, and cockroaches.

From observation of the data results, due to the fact that significantly more food and water was consumed by ants, spiders, and cockroaches in Chamber B (no repeller), I conclude that the ants, spiders, and cockroaches behavior was caused by the Bell + Howell Ultrasonic Pest Repeller when the device was switched on.

B. Evaluation of Tabular Data: Test Results and Data Measurement of Rats and Mice (Intertek)

The tables labeled “Test Result” for rats and “Test Result” for mice lists the raw data for Chamber A (with pest repeller) and Chamber B (no repeller). *See* Test Result of Rats, p. 5; *see* Test Result of Mice, p. 6. This data measured “quantity,” “consumed water,”¹⁴ and “consumed food”¹⁵ for the two-day Pre Test (Switch Off),

¹⁴ The amount of consumed water was measured in milliliters.

¹⁵ The amount of consumed food was measured in grams.

seven day During Testing (Switch On), and two-day Post Test (Switch Off).¹⁶ I conducted weighted comparisons between the food and water consumed for Chamber A and Chamber B for both rats and mice.

1. Consumed water and food percentage of the rats in Chamber B (no repeller)

(Table 9)

Chamber B (no repeller)											
RATS	PRE TEST		DURING TESTING							POST TEST	
	SWITCH OFF		SWITCH ON							SWITCH OFF	
	-2 Day	-1 Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	+1 Day	+2 Day
Quantity	4	6	4	2	1	0	0	0	0	3	5
Water	50.90	51.88%	55.36%	84.23%	76.21%	77.49%	69.49%	67.71%	70.16%	23.71%	30.41%
Food	48.04%	53.27%	56.67%	75.96%	69.88%	76.67%	70.60%	53.74%	62.72%	40.58%	35.29%
Chamber A (with pest repeller)											
Quantity	4	6	4	2	1	0	0	0	0	3	6
Water	49.1%	48.2%	44.63%	15.77%	23.82%	14.73%	25.99%	32.28%	29.84%	76.68%	69.58%
Food	51.13%	33.83%	43.32%	24.03%	30.37%	23.32%	29.40%	34.34%	37.28%	59.42%	64.70%

The facts described by the recorded data indicate that each day during the seven day During Testing period when the repeller was switched on, significantly more water and food was consumed in Chamber B (no repeller) than Chamber A (with pest repeller). Consumption by rats in Chamber B (no repeller) ranged from (55.36% to 84.23% for water) and (53.74% to 75.96% for food) until the Post Test days when the repeller was switched off.

During the Post Test days, the food and water consumption was statistically the same, at approximately 50%, between the two chambers demonstrating that the

¹⁶ The “Switch On” and “Switch Off” indicates when the ultrasonic pest repeller was turned on within Chamber A (the chamber with the ultrasonic pest repeller).

rats equilibrated in Chambers A and B. This shows that the rats moved freely between the two chambers once the repeller was turned off and that the biological activity was *greater* in Chamber B (no repeller) when the repeller was turned on. Therefore, the data exhibited that the *rats were repelled* from the Bell + Howell Ultrasonic Pest Repeller.

2. Consumed water and food percentage of the mice in Chamber B (no repeller)

(Table 10)

Chamber B (no repeller)											
MICE	PRE TEST		DURING TESTING							POST TEST	
	SWITCH OFF		SWITCH ON							SWITCH OFF	
	-2 Day	-1 Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	+1 Day	+2 Day
Quantity	6	5	8	10	9	9	10	10	10	4	6
Water	52.85%	55.63%	59.59%	65.29%	58.72%	75.44%	72.45%	82.32%	67.36%	37.02%	48.99%
Food	32.51%	52.77%	51.29%	60.32%	65.49%	64.68%	64.74%	64.68%	55.37%	51.60%	51.01%
Chamber A (with pest repeller)											
Quantity	4	5	2	0	1	1	0	0	0	6	4
Water	47.15%	44.56%	40.41%	34.71%	41.28%	24.56%	27.55%	17.68%	32.64%	62.98%	57.96%
Food	67.76%	47.23%	49.14%	39.68%	34.51%	35.32%	35.26%	37.34%	44.63%	48.40%	48.99%

The facts described by the recorded data indicate that water consumption was slightly higher in Chamber B (no repeller) than Chamber A (with pest repeller) During Testing with the switch on. Food consumption was significantly higher in Chamber B, as would be expected with mice because they hydrolyze water from the food they consume. This discrepancy explains why the amount of water consumed is similar in both chambers in the During Testing period.

In the two Post Test days when the Bell + Howell Ultrasonic Pest Repeller was switched off, the food and water consumption was essentially equal in Chambers A and B because the mice equilibrated. This shows that the mice moved freely between the two chambers once the repeller was turned off and the biological activity was *greater* in Chamber B (no repeller) when the repeller was turned on. Therefore, the data exhibited that the *mice were repelled* from the Bell + Howell Ultrasonic Pest Repeller.

3. Observed and recorded data of rats and mice fecal pellet & urine spots

SWITCH ON/OFF		DATE	SUBJECT	OBSERVATION OF FECAL PELLETT & URINE SPOTS	
				Chamber A (with pest repeller)	Chamber B (no repeller)
PRE TEST	SWITCH OFF	17-May-14	MICE	Equal	Equal
			RATS	Equal	Equal
		18-May-14	MICE	Equal	Equal
			RATS	Equal	Equal
DURING TESTING	SWITCH ON	19-May-14	MICE	Equal	Equal
			RATS	Little	Equal
		20-May-14	MICE	Little	More
			RATS	Little	More
		21-May-14	MICE	Little	More
			RATS	Little	More
		22-May-14	MICE	Little	More
			RATS	Little	More
		23-May-14	MICE	Little	More
			RATS	Little	More
		24-May-14	MICE	Little	More
			RATS	Little	More
		25-May-14	MICE	Little	More
			RATS	Little	More

POST TEST	SWITCH OFF	26-May-14	MICE	Equal	Equal
			RATS	More	Little
		27-May-14	MICE	Equal	Equal
			RATS	Equal	Equal

(Table 11)

The data described in Table 11 (above) coincides with the consumption and non-consumption of food and water data provided in Table 9 and 10. All three Tables demonstrate that the more food and water rats and mice consumed in Chamber B (no repeller), the higher amount of fecal and urine they deposited in Chamber B. By my observation, both rats and mice had “more” fecal pellets and urine spots in Chamber A, while Chamber B had “little” or “equal” amounts as recorded by the observer. Thus, the rats and mice were *repelled* from the Bell + Howell Ultrasonic Pest Repeller, displayed by the overall higher amount of activity in Chamber B (no repeller).

4. Conclusion of the evaluation of tabular data: Test results and data measurement of rats and mice

The researchers concluded that the rats and mice were repelled from Chamber A (with pest repeller) when the Bell + Howell Ultrasonic Pest Repeller was switched on. *See* 2015 Rats/Mice Test Report Result Analysis, (July 7, 2014). In their report, the reserchers followed good laboratory practices in their scientific design that would be acceptable to many testing organizations. The report states:

The tunnel was “curved” and two chambers were designed in Hi-Lo level. The curved and Hi-Lo tunnel design was to further ensure ultrasonic sound wave[s] will not enter from [C]hamber A into [C]hamber B since sound wave[s] [are] directional.

Id. Ultrasonics are soundwaves with frequencies higher than the upper audible limit of human hearing. Ultrasound is no different from normal (audible) sound in that its physical properties cannot be heard by humans at approximately 20 kilohertz (20,000 hertz). The curved tunnel design and “Hi-Lo” level protects the direction of the ultrasonic waves of the Bell + Howell Ultrasonic Pest Repeller. This inhibits the waves from going on a straight plane from Chamber A to Chamber B, confusing the rodents.

In addition, the scientific design of the experiment conducted by Intertek adhered to good laboratory practices because they used electronic scales (not manual scales) to measure food and water before and after each day of the eleven day test.¹⁷ The scientific design and data, combined with good laboratory practices, confirms to me that the SGS experiments are a credible approach to proving that the Bell + Howell Ultrasonic Pest Repeller effectively repels rats and mice.

From observation of the data results, due to the fact that significantly more food and water was consumed by rats and mice in Chamber B (no repeller), I conclude that the rats and mice behavior was caused by the Bell + Howell Ultrasonic Pest Repeller when the device was switched on since the ultrasonic repeller was the only variable in each test that consistently showed consistent with the testing from each independent testing company.

¹⁷ The use of electronic scales is more accurate than manual scales. This leads to more precise and reliable measurements.

IV. EVALUATION OF THE VALIDITY OF DR. RICHARD KAAE'S TEST DESIGNS AND REPORT

1. Dr. Kaae states, "For all other types of pest control, including pesticides and other repellents, in the United States, extensive field testing is required by the Environmental Protection Agency for registration and sale of said products." (Doc. 25-1, p. 4 ¶ 1). While this is somewhat correct, devices do not require EPA registration because they are exempt under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). 40 C.F.R. § 152.25. However, devices do need an establishment number for manufacturing that cannot be put on the product or label.
2. Dr. Kaae's test method on ants included placing the Bell + Howell Ultrasonic Pest Repeller "2 feet from and pointed directly towards each established trail" or food source. (Doc. 25-1, p. 10 ¶ 2). This technique led Dr. Kaae to believe that the ultrasonic repellents are unidirectional, such that only a few points on the compass provided the repellent effect, as opposed to providing a 360-degree repellent effect. Dr. Kaae should have used multiple repellents as stated in manufacturer's recommendations on the labels in his test design.
3. Since Dr. Kaae's tests were done outdoors, his observations were taken on one specific "established" foraging trail from each nest for each repeller tested. It is possible and even more probable there were additional foraging trails that appear to originate from different nests. Yet, he failed to prove

that to be the case. As multiple foragers are out, presumably foraging in all directions until a food source is found, it is likely foragers from any number of nests could find the same food source and form a trail to the same source, including from trails not subject to a repeller, yielding another possible false positive conclusion. D. Kaae's experiment was outdoors as stated above, however, the Bell + Howell Ultrasonic Pest Repeller is for indoor use exclusively and if used outdoors you are not adhering to the label instructions for indoor use exclusively; if used outdoors, you are not adhering to the label instructions.

4. Dr. Kaae typically took photographs two times a day to document the feeding activity of the ants at the food source. (Doc. 25-1, p. 11 ¶ 1). In my experience, we would always use video data which is more valuable and conclusive. Further, Dr. Kaae did not indicate what times each day the photographs were taken, leaving the reader to wonder when during the normal diurnal behavior pattern the two counts were taken. This approach is misleading to readers. If such information were taken at a time ant foraging behavior was normally low his data would be providing a false negative.
5. Dr. Kaae cites Ballard et al., 1984, which states that repellency against cockroaches is effective. *See* (Doc. 25-1, p. 6, Table (a)).

6. Dr. Kaae cites Ballard & Gold, 1983, which states that the test results are inconclusive. *See id.* To scientists, inconclusive test results means that researchers did not fully resolve all doubts or questions, and without final results or outcome the experiment is inconclusive. The experiments should have been repeated.
7. On page 8, Table (e), Dr. Kaae cites a graph of “Summary of Kansas State Reported Success.” The graph states that “Device A” had “Good Effect” on cockroaches. There are five devices listed without names, “Device A” could be the Bell + Howell Ultrasonic Pest Repeller.
8. Kansas State University is quoted on their experiments and results as having “questionable effects.” (Doc. 25-1, p. 9 ¶ 1). The term “questionable” to scientist’s means, open to question or dispute, uncertain results or outcome. In science this means that the experiment is unproven and more work needs to be done.
9. It is unclear whether Dr. Kaae confirmed the frequencies of the test units.
During my research and testing with flying insects we used multiple frequencies which had to be confirmed as they drift depending upon the quality of the components, heat, stress, and use.

10. Dr. Kaae did not do any testing on rodents, cockroaches or spiders to confirm or disprove the tests conducted by SGS and Intertek, which is standard procedure in challenging research findings. He only tested ants outdoors and used a sugar solution which is highly attractive to many insects, especially ants. This biases the experiment because you are forcing the ants with the highly attractive sugar solution to move towards the sugar solution and have no way to choose another direction. You are manipulating the organisms to strengthen your hypothesis which gives misleading results.

While at Johnson Wax as Director of Technical Development, I worked on a rodent repellent for rats and discovered a powerful active repellent. I secured trailers and contracted to have wild caught rats in Ohio to be shipped to our trailers which were installed with video cameras that recorded 24/7. Food and water was placed behind the repellent and we recorded the behavior; the desire of the rats was too great to eat and drink the water that the rats would cross the highly repellent active to get to the food and water no matter how effective the active was.

When you force biological organisms like ants to feed on a highly attractive sugar and water solution they will do exactly that, and therefore, Dr. Kaae has introduced a significant biases into the experiment, by using the pest repeller outdoors and forcing the ants to move in the direction of the sugar and water solution. This is often observed as a false positive.

V. CONCLUSIONS

In my opinion SGS and Intertek have both conducted laboratory experiments with well thought out designs, following good laboratory practices as closely as they could which is time consuming and costly. The data indicates that the experiments by both companies demonstrate that the Bell + Howell Ultrasonic Pest Repeller used in their research testing on rats, mice, spiders, cockroaches, and ants consumption of water and food and their movement or lack of movement in Chamber A (with repeller on) versus Chamber B (no repeller) is valid and acceptable to scientific principles. This is in contrast to Dr. Kaae, who did not follow good laboratory practice guidelines, and inconsistencies in his conclusions as states above. Therefore, Dr. Kaae's work and conclusions are open to interpretations, questions, and doubts. His experiments should be redesigned and retested.

In conclusion, the recorded results for all the tests by SGS and Intertek, as stated in the **Bell + Howell Ultrasonic Pest Repeller Efficacy Test Report**, follow acceptable patterns for choice tests. Based on my evaluations of the observed and recorded results from the laboratory tests from SGS and Intertek, the Bell + Howell Ultrasonic Pest Repeller, and from my experience in the pest management practices, the Bell + Howell exhibits repellent properties consistently throughout the series of tests conducted by both research companies.

Background of Jeffrey K. Brown, Ph.D., R.P.E., B.C.E.

I have been a Registered Professional Entomologist and Board Certified Entomologist for over 30 years. Both my Bachelor of Science, in Vertebrate Zoology, and Ph.D., in Medical Entomology, were completed at the University of California, Davis. There, I was hired as a Post Doc for Dr. Robert K. Washino; a world-renowned Medical Entomologist. I received my M.B.A. in Management from Central Michigan University through the Department of Defense while I was serving in the United States Air Force. I was direct commissioned as a Captain and served as a Medical Entomologist with the Armed Forces Pest Management Board.

I have also served as the Executive Director of the American Sanitation Institute, and was the Director of Technical Development for S.C. Johnson Wax for 10 years. I created insect control devices for Johnson Wax. I was also the President for Future Scope Industries and Nacon Technologies. Presently, I am a Bureau Director for the Mississippi State Department of Health, and serve as the State Medical Entomologist. I am also currently the Director General for the American Academy of Entomological Sciences. Recently, I was asked to present at the Forum on Zika Virus in Washington, DC. There, I presented to the National Academies of Science, Engineering, and Medicine as an invited guest. The meeting took place over three days, with representatives from government and private companies.

I have 13 publications, one book, and 5 patents (on insect control devices). During my time at Johnson Wax, the group I put together created the Vector Electronic Fly Trap®. The Vector Electronic Fly Trap® displaced insect

electrocution devices for indoor facilities as we proved and published the findings that insect electrocution devices (known as “bug zappers”) blow insects into millions of microscopic particles as well as metal particles and bacteria into the area around people. These particles would stay airborne for many hours.

I sit on the committee for BCE (Board Certified Entomologist) that creates the test questions for individuals who desire to become a Board Certified Entomologist in Veterinary and Medical Entomology.

/s/ Jeffrey K. Brown
Jeffrey K. Brown, Ph.D., R.P.E., B.C.E.
Director General